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Water Level Management Update

Pool 6 Drawdown –The Fifth Time was the Charm

Rain made the Pool 6 drawdown a reality for summer, 2010 after cancellations in 2003, 2004, 2008, and 2009. On June 18, 2010 the pool regulation orders were delivered to Lock and Dam 6 (Trempealeau, WI) to "let the drawdown begin!"

However, excessive rain, dredging schedules and the need to draw the pool down slowly, meant the full 1-foot drawdown was not seen until July 1. The continuous high summer flows also meant that only the lower portion of the pool (below Winona, MN) experienced the effects of the drawdown.

Aerial View of lower Pool 6 on July 16, 2010. The drawdown only affected the portion of the pool below Winona, MN. The area exposed appears as tan edges around the islands. Wisconsin DNR photo

Recreational Access Challenges

Water Level Management Task Force team members were kept busy with recreational access challenges from two marinas located in the heart of the drawdown zone. As a result, additional resources were dedicated to these marinas to maintain the full drawdown through as much of the summer as possible.

And then there was the Rain

While counter-intuitive, high flows and above average rain actually create conditions suitable for a drawdown. Three of the previous four attempts at drawdowns in Pool 6 were cancelled due to the lack of sufficient flow (not enough water) to even start the drawdown. So the summer of 2010's record setting rainfall was a bonus.

The pool was maintained at the 1-foot reduction from July 1 through August 9 when low flows in the river were not adequate to maintain the required minimum water level and the pool level was raised, flooding the exposed areas in the lower part of the pool.

And then the rains came again. The August 13 heavy rainfall bumped the flows back up and let the drawdown resume. By August 20, the pool was back to the 1-foot drawdown.

Floating Mats of Plant Debris

While the record setting rain was just what was needed for the drawdown, it created some system wide unusual river conditions that ultimately contributed to the early end of the drawdown.

The rains that fell in mid-August raised the water levels and flows which uprooted beds of submersed vegetation in Pools 4-10 and sent it downstream in car-size floating mats. These mats caught on anything and everything in their path and were pushed into slow moving backwater areas. For more information see "Weird Weather Patterns Intensify Aquatic Plant Problems."

The effects were seen from Fountain City, WI where public docks were inundated to the Dairyland power plant in Pool 9 that shut down for several days due to vegetation plugging intakes.

On August 25, the water level forecast was bleak. Low flows were again predicted and the drawdown was not expected to last another week. This coupled with vast amounts of vegetation causing recreational access and boating problems for the two marinas in lower Pool 6 led to the decision to end the drawdown and return to normal summer levels by Labor Day.

Inside this Issue:

Pool 6 Summary:

- **1-foot drawdown**
- **June 18 - began lowering water, reached 1-foot drawdown on July 1**
- **Preliminary estimates suggest 133 acres were exposed.**
- **Lost drawdown August 9 due to low flows**
- **Regained 1-foot drawdown August 20**
- **August 25– began raising pool levels and drawdown ended by Labor Day.**

Groundbreaking Research into Effects of Drawdowns on Mussels Continues

While the Pool 6 drawdown was challenging, it did provide the opportunity to conduct two studies to look at the effects of drawdowns on native mussels. These groundbreaking studies are imperative to the future of drawdowns up-and-down the Mississippi River system.

Mary Stefanski,
Water Level Task Force Chair

The U.S. Geological Survey (La Crosse, WI) and the U.S. Fish and Wildlife Service (Winona, MN) teamed up to follow the movement and survival of two common mussel species in Pool 6 during the summers of 2009 and 2010.

Recent surveys of mussels show that there is a considerable mussel population in Pool 6 (estimated at nearly 61 million mussels), and a small fraction of these live in shallow water—the area presumed to be most affected by a drawdown.

Resource managers have questions about the fate of mussels residing in shallow water during drawdowns. It is likely that not all mussels are killed—some mussels are able to move out of the drawdown zone and reach deeper water while others may survive by burrowing into river sediments.

The results of this study will provide:

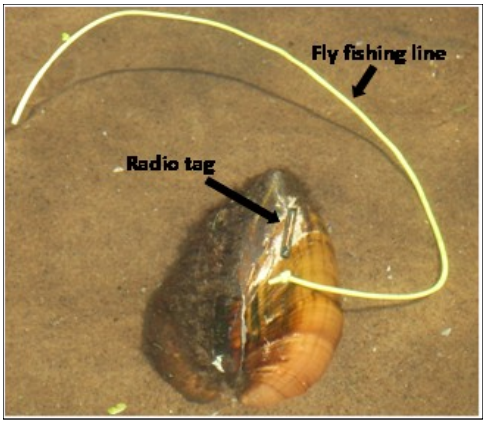
- An estimate of the efficiency of finding mussels in a large river system using radio tags.
- Natural movement patterns of mussels in high slope and low slope regions of the Mississippi River.

Ultimately the goal is to use radio tracked mussels to provide an estimate of the effect of a drawdown on native mussel populations.

Details of the Mussel Study

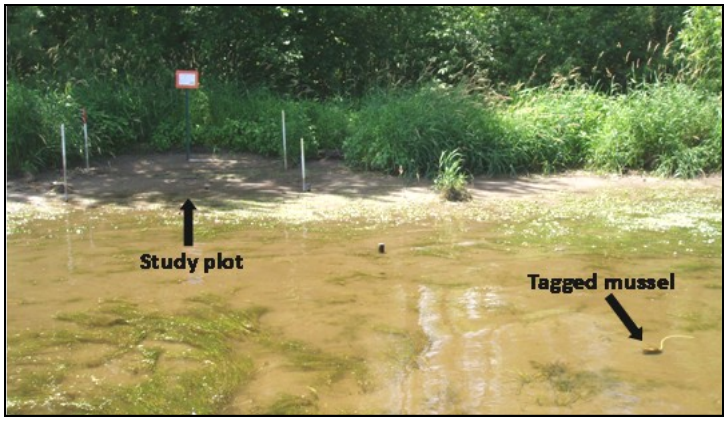
Researchers attached small radio tags to 480 mussels in 2009 and 2010. These tags let researchers track individual mussels in 12 study plots, including control areas unaffected by the drawdown, and areas likely to be dewatered.

The research plots were located in areas with high slope (relatively easy for mussels to move to deeper water) and low slope areas (more difficult for mussels to reach deeper water).



A pocketbook mussel showing the radio tag and buoyant line marker (fly fishing line) attached to its shell. The fly fishing line is used to measure how deep the mussel is burrowed into the substrate without disturbing the mussel.

The mussels were located weekly from June through November 2009 (non-drawdown year) and from June through September 2010 (drawdown year). This was the first time radio tiags were used on mussels in a large river.



One of the 12 study plots showing the PVC pipes that outline where the mussels were placed before the drawdown began. All 4 PVC pipes were in water prior to the drawdown. This image was taken about 4 days after the drawdown began. Note the movement of a mussel from the study plot in the lower right.

Preliminary results include:

- Methods were developed of rapidly applying PIT (passive integrated transponder) tags and buoyant line markers to mussels. Loss of radio tags was negligible (<1%) over the study period.
- Recovery of tagged mussels was excellent and exceeded 88% in both years.
- Estimated mortality was 5% during the non-drawdown year (2009) and 22% during the drawdown year (2010).
- Mortality of threeridge mussels was 2% in 2009 and 26% in 2010; mortality of pocketbook mussels averaged 7% in 2009 and 19% in 2010.

Analysis of horizontal movement rates is ongoing.

Preliminary Results of Plant Monitoring

U.S.G.S. photo

During August and September 2010, scientists from the U.S. Geological Survey (USGS), Upper Midwest Environmental Sciences Center (UMESC) monitored the response of vegetation on substrates exposed during the 2010 drawdown on Pool 6 . The evaluation is on-going, however some preliminary results are available.

U.S.G.S. photo

Aerial photography on July 27, 2010 (the approximate time of peak drawdown) allowed researchers to assess the extent of sediment exposure and determine how much and where emergent and moist-soil plants responded; preliminary estimates suggest that 133 acres of substrate were exposed.

U.S.G.S. photo

Vegetation response was monitored by collecting and identifying all the plants inside a square frame at 141 randomly chosen sites. At the sample sites, the average length of exposure was 22 days, and ranged from 1 to 66 days. These sites were dominated by submersed, moist-soil, and floating-leaved aquatic species.

Researchers identified 79 plant species. The most frequently observed species were grassleaf mudplantain, Canada waterweed, coon tail, rice cutgrass, curly-leaved pondweed, reed canary grass, and white waterlily. Other common moist soil species included redroot flatsedge, chufa flatsedge, and nodding smartweed. Emergent perennial species such as sessilefruit arrowhead, common arrowhead, and broadfruit bur-reed were less frequently observed.

Perennial and moist soil plant densities were generally related to:

- the amount of time the substrate was exposed,
- to the elevation above the water's surface,
- the reduction in soil moisture level.

Scientists are still in the process of evaluating the relationships between sediment exposure times, sediment elevations, and plant responses in 2010.

Chufa flatsedge

U.S.G.S. photo

What's Next for Water Level Management?

The Water Level Management Task Force has determined that the conditions needed to conduct a second year drawdown in Pool 6 are highly unlikely and a drawdown will not be pursued in 2011.

However, the Task Force believes the benefits to habitat and water quality make drawdowns one of the most valuable tools for habitat management on the river and will continue to pursue drawdowns in pools throughout the system. Each drawdown provides river managers and the public with new knowledge about this restoration tool, in part because the experience in each pool has been somewhat different.

The Task Force will continue to evaluate the effects of the past drawdowns and explore options to move forward in Pools 8 and 3 in next few years.

A Picture is Worth a Thousand Words

Biologists and natural resource managers depend on good scientific data. They use facts, figures, numbers and statistics as tools for evaluating their work and making future management decisions.

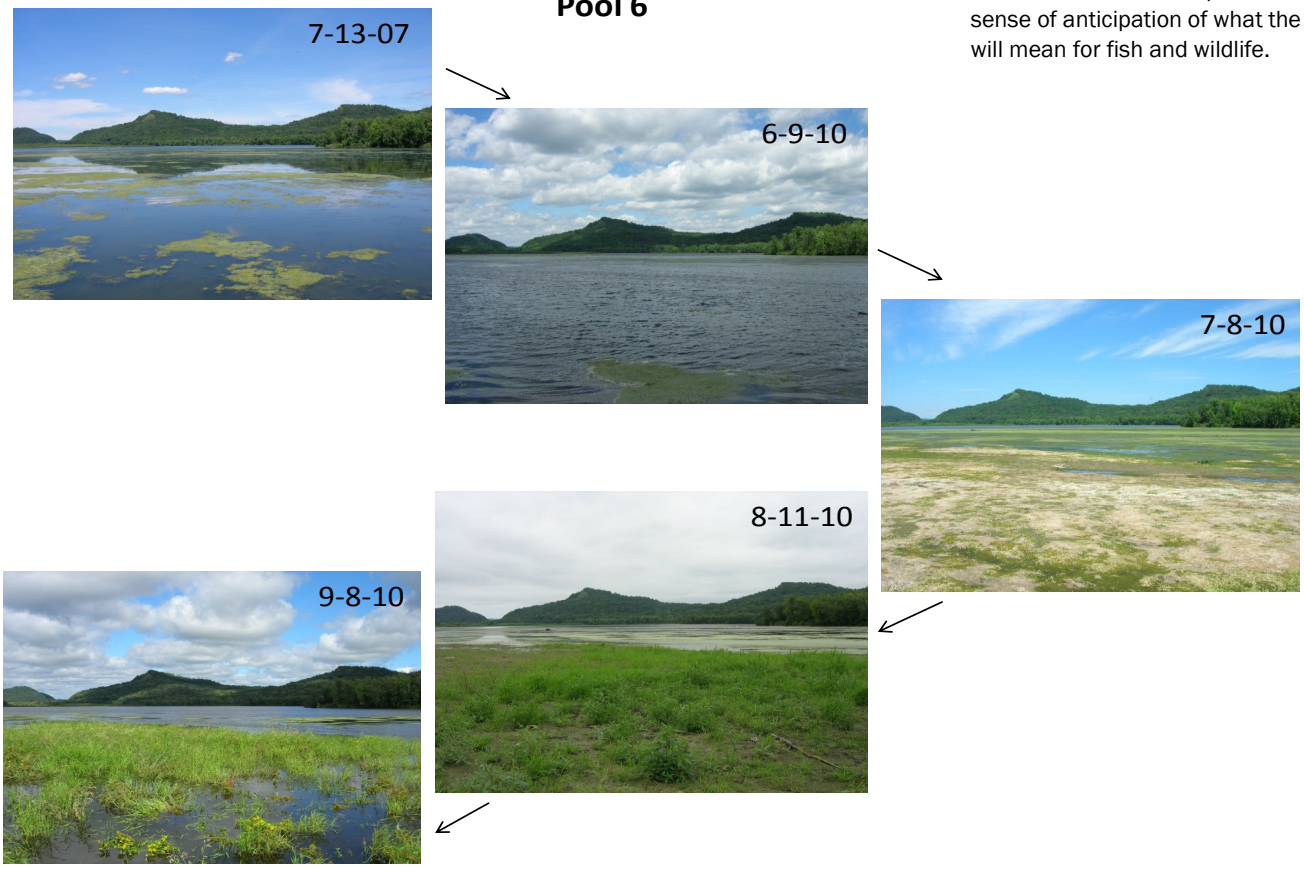
As important as the numbers are, managers also recognize the value in the old saying, "a picture is worth a thousand words." For most non-biologists, reading that plant abundance increased 45% and biomass nearly tripled doesn't get their heart rate up. However, if you're a duck hunter, and you look at a picture of a marsh that just happens to have 45% more aquatic plants, you might start looking forward to fall.

The Water Level Management Task Force recognizes the importance of "seeing" results. Consequently, photo stations were established at each of the river pools proposed for drawdown. These stations were set up at fixed sites that were expected to be dewatered during a drawdown.

For each pool, photos were taken one or more years in advance of any drawdown activity. These photos provide an excellent reference condition. During the drawdown year, a series of photos are taken prior to, during, and following the drawdown. Photos are also taken in years following the drawdown.

Photo series provide managers with a quick snapshot of where and what kind of plants grew on the exposed soil, how thick they grew and how long they persist. However, just like the duck hunter, these photos also provide a sense of anticipation of what the changes will mean for fish and wildlife.

Pool 6



Weird Weather Patterns Intensify Aquatic Plant Problems on the Mississippi River

Periods of calm winds, hot weather and an ample supply of nutrients provided the ingredients for the development of the green carpet of algae and duckweed that formed by late July in Pools 4-10.

The heavy rainfall in mid August raised the water level of the river. The increased current combined with strong storm winds uprooted aquatic plants in backwaters and the main channel border. As a result there was a tremendous amount of underwater vegetation, duckweed, and algae moving downstream which caused problems from Pool 4-Pool 10.

Wisconsin DNR photos

The most common question heard on the Mississippi River during the summer of 2010 from Wabasha to Prairie du Chien was "What is the cause of all the "weeds" on the river?"

During July, huge mats of filamentous algae and duckweed (referred to by some people as pond scum) formed on top of aquatic plant beds in main channel borders and backwaters of the Mississippi River. It was a widespread natural occurrence that made boating, fishing, and other recreational activities in the affected areas difficult.

To make matters worse, In mid August, large quantities of this plant material washed downriver as a result of a quick and substantial rise in water levels, causing a different array of problems.

Improved Water Clarity

"Causes for the large mats were many, including clear water, high nutrients, periods of calm weather, low current, warm water and other factors," said John Sullivan, Water Quality Specialist - Wisconsin Department of Natural Resources. "Of these factors, water clarity was likely the most important."

This scenario began with the high water clarity on the river during the summer of 2009, which provided a boost to the development of new plants in Spring 2010. Water clarity allows light to reach the river bottom, which is necessary for the growth of aquatic plants. This was followed by very good light penetration in May and early June, 2010. "Light penetration monitoring at locks and dams near Genoa and Lynxville indicated the highest values in late spring and early summer since we started checking in 1988," said Sullivan.

The clear water enabled aquatic plants to flourish, even in water that was 5-6 feet deep, water depths where plant growth has been rare. The plants quickly reached the surface of the water despite an increase in water levels in mid May.

Sizeable Zebra Mussel Population

Sullivan believes that the sizeable zebra mussel population that exists in the river was a large factor in the high water clarity values found in May. Zebra mussels in large numbers have the ability to make the river water clearer because an adult zebra mussel can filter a liter of water per day, siphoning out all the small particles they encounter. Water clearing by zebra mussels in the mid 1990s was a contributing factor in the recovery of the aquatic plant beds from the scarcity which existed in the early 1990s.

Weird Rainfall Patterns

The river level peaked about May 22 in Pool 8 (near La Crosse, WI) and then receded until mid June, during which time algae and duckweeds grew in a lush manner. Another rise in water levels occurred at that time due to heavy rains, which floated filamentous algae and duckweeds loose, moving them downstream in the current where they accumulated in the quieter water in the lower part of the pools.

The water gradually receded through July and algae and duckweeds grew vigorously in the quiet conditions provided by the extensive beds of aquatic plants that had reached the waters surface in early June. Fueled by periods of calm winds, hot weather and an ample supply of nutrients, the algae and duckweeds quickly formed extensive mats that resembled a large green carpet in late July and early August in Pools 4-10.

This dry period was followed by the heavy rainfall in mid august which caused a rapid and substantial rise in water levels.

Widespread Problem

The river was not alone in facing this problem. Scott Provost, Water Resources Specialist-Wisconsin DNR reported a bumper crop of Canada waterweed and coon tail existed across the state this past summer. Inland waters that have large watersheds are showing similar growth patterns .The rain events this year increased nutrient loads in Wisconsin's waters that created some trying conditions.

No Easy Answers

Unfortunately, there are no quick and easy answers to solve this problem. "I don't expect any major change in the foreseeable future," Sullivan said. "If we see a crash in zebra mussels and this is followed by a spring with high flow in the river with turbid or muddy water, perhaps the vegetation will reset to a lower level due to the reduced water clarity." A reduced amount of the plants that grow below the water's surface will result in less algae and duckweed as the plants provide a quiet place for their growth.

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